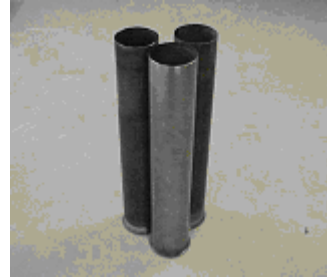


Optimized Flowformed Steel Cartridge Cases



PROBLEM / OBJECTIVE

Cartridge cases for the military have traditionally been deep drawn. However, the Navy and DoD no longer have access to a domestic manufacturer. The equipment and tooling has been transferred to Riverbank Army Ammunition Plant, but it has been estimated that a \$20 to \$25 million dollar investment would be needed to resume production.

NSWC-IHD had identified flowforming as a promising alternative manufacturing technology for this application, but initial development efforts were disappointing. The objective is to enhance the flow forming process to allow it to be cost effectively used to manufacture five-inch cartridge cases.

APPROACH / BUSINESS STRATEGY

Process Improvement:

NSWC-IHD initially evaluated the standard AISI 1030 alloy steel originally used in the deep drawing process. Since this alloy was not ideally suited to the flowforming process, some higher-strength alloys, such as AISI 4130 and 4340, were evaluated.

The metalworking characteristics of the alloys chosen for study varied significantly during flowforming, heat treatment and tapering operations. The NCEMT team initially down-selected and successfully fire-tested AISI 8620. An understanding of the metallurgical response to this low alloy steel led to a final optimization step. AISI 94B15 offers an improved balance in alloy chemistry that will minimize distortion. This alloy is expected to improve forming properties, and will maximize strength and spring-back characteristics when exposed to an ignited propellant charge in a gun barrel.

Investigations in heat treatment resulted in less distortion and improved mouth hardness. Numerical process modeling was utilized to redesign the taper die tooling and eliminate an early fatigue failure problem in the tool.

ACCOMPLISHMENTS / PAYOFF

Implementation

Manufacturing development under this project has been performed at the subcontract vendor locations under guidance from the NCEMT.

NSWC-IHD will coordinate with NSWC-Crane Division for the final implementation step, a Product Improvement Plan (PIP). This will qualify the flowformed cases for production procurement.

Expected Benefits

The cost avoidance to investment ratio was 16.7:1, with a net present value of \$23.9M. This was based on reduction in the cost of the cartridge cases from \$300 to \$200 each, and avoidance of \$15M in capital investment.

TIMELINE/MILESTONES

Start Date: October 1997

End Date: March 2003

FUNDING

Navy ManTech - \$1.4467M

Cost Sharing:

NSWC-IHD: \$0.850M initial direct funding

NSWC-IHD: \$0.592M value of shared gun tests

NSWC-IHD: \$0.060M direct support of NCEMT

Dynamic Machine Works: \$35K

Owego Heat Treat: \$12K

PARTICIPANTS

Dynamic Machine Works Inc.

Ellwood City Forge

MCS Associates, Inc.

Owego Heat Treat, Inc.

National Center for Excellence in Metalworking Technology

Naval Surface Warfare Center-Indian Head Division

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